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In vivo targeting of cutaneous melanoma using an MSH-engineered human protein cage bearing fluorophore and MRI tracers

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Background

Nanoparticle (NP)-based materials are very promising agents for enhancing cancer diagnosis and treatment. Once functionalized for selective targeting of tumor expressed molecules, they can specifically deliver drugs and diagnostic molecules inside tumor cells.

Materials and methods

In the present work, we evaluated the in vivo melanoma-targeting ability of a nanovector (HFt-MSH-PEG) based on human protein ferritin (HFt), functionalized with both melanoma-targeting melanoma stimulating hormone (α-MSH) and stabilizing poly(ethylene glycol) (PEG) molecules. We used two independent and complementary techniques, such as whole-specimen confocal microscopy and magnetic resonance imaging, to detect the in vivo localization of NP constructs endowed with suitable tracers (i.e., fluorophores or magnetic metals).

Results

Targeted HFt-MSH-PEG NPs were shown to accumulate persistently at the level of primary melanoma and with high selectivity with respect to other organs. Melanoma localization of untargeted HFt-PEG NPs, lacking the α-MSH moiety, was less pronounced and disappeared after a few days. Further, HFt-MSH-PEG NPs accumulated to a significantly lower extent and with a different distribution in a diverse type of tumor (TS/A adenocarcinoma), which does not express α-MSH receptors. Finally, in a spontaneous lung metastasis model, HFt-MSH-PEG NPs localized at the metastasis level as well.

Conclusions

These results point at HFt-MSH-PEG NPs as suitable carriers for selective in vivo delivery of diagnostic or therapeutic agents to cutaneous melanoma.

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